



Gars are among the most commonly targeted fish by bowfishers.



# bowfishing in Oklahoma

**Enjoyment, Sustainability, Long-term  
Public Benefit Become Major Goals  
in a Management Strategy**

**By Jason Schooley, Senior Fisheries Biologist  
and Dennis Scarnecchia, Fisheries Professor,  
University of Idaho**

**B**owfishing — the taking of fish with a bow and arrow or a crossbow — is among the fastest-growing types of sportfishing in the United States. It is much like archery hunting for game animals except that the arrow is connected to a string, and the string is connected to a retrieval mechanism similar to a typical fishing reel.

In Oklahoma and nearly all other places, bowfishers specifically target nongame fishes. Examples from Oklahoma include nonnative and invasive carps (common carp, Asian carps, grass carp) and native species such as gars, buffalofishes, carpsuckers, and occasionally paddlefish or flathead catfish. Bowfishing can be practiced at all hours but is commonly practiced at night using boats equipped with lights.

### *Gaining in Popularity*

Any online search quickly shows the passion and fervor that bowfishers have for their sport. Growth in archery participation, including youth archery programs, has been accompanied by numerous technological advances, increasing sales of bowfishing equipment, and increases in the number of tournaments.

In addition to bowfishing's recreational benefits of being out on the water and interacting close-up with fish and wildlife, archery is well known for providing relaxing and therapeutic benefits to its participants.

Many bowfishing tournaments for all ages and skill levels take place in Oklahoma waters. The Youth World Bowfishing Championship held its 16th annual event on Fort Gibson Lake in August 2020. High-profile tournaments for adults such as the 2018 Bass Pro® U.S. Open Bowfishing Championship have been held on Oklahoma reservoirs, drawing competitors and spectators from throughout North America.



*Youths attending the Department's Wildlife Expo have a chance to experience bowfishing.*

Non-tournament opportunities also abound. Many Oklahomans and visitors to the state participate in bowfishing year-round in a leisurely, non-competitive way.

Although bowfishing in Oklahoma is not new, the expansion of the sport and improvements in technologies in the past few decades have resulted in more efficient take and more satisfied bowfishers of all ages. Along with this success comes the need for the Oklahoma Department of Wildlife Conservation, as trustees of the public's fishery resources, to ensure that the sport is not only providing bowfishing opportunity but benefiting ODWC's conservation mission and efforts at sustainably managing native fishes for long-term public benefit.

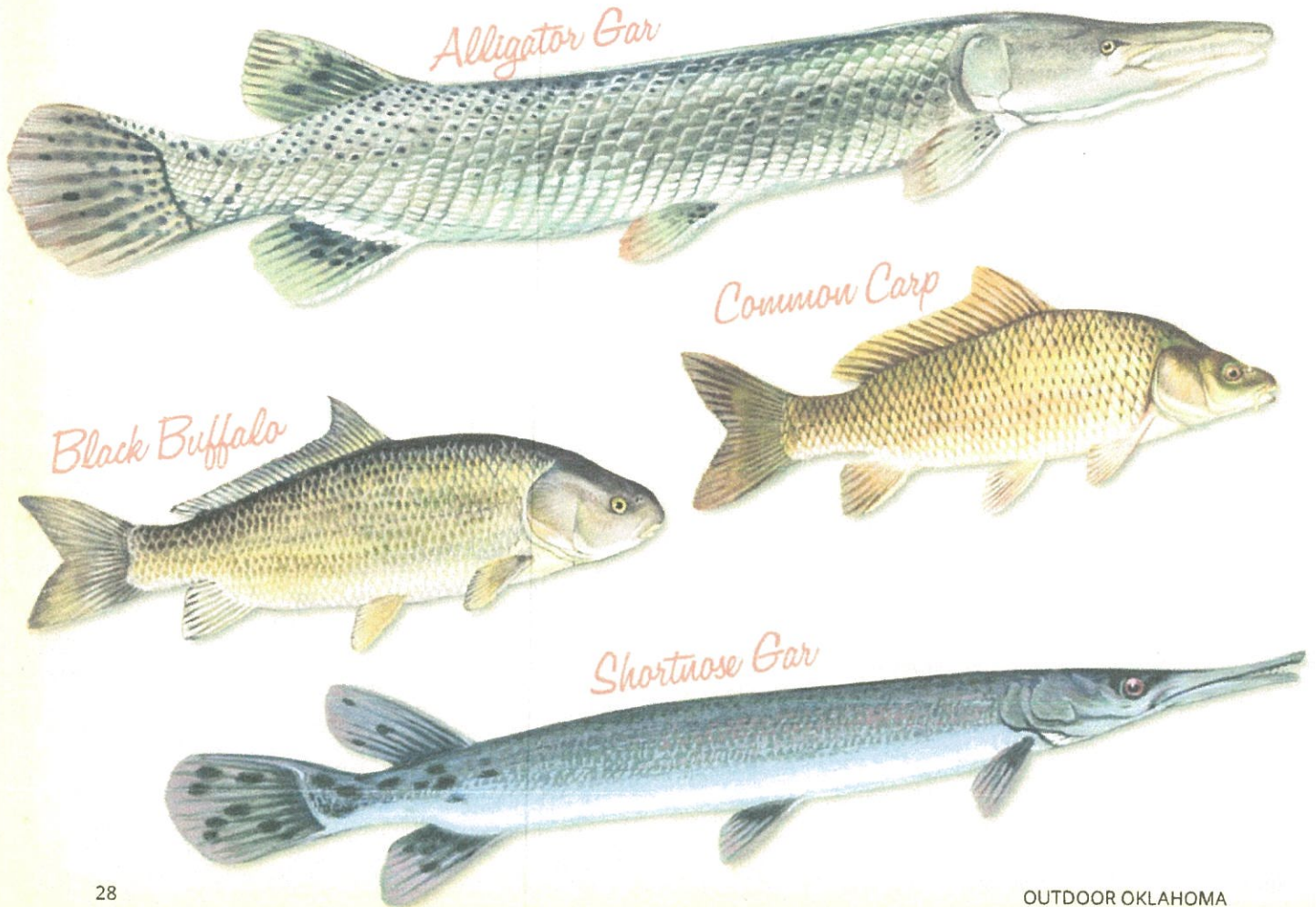
ODWC seeks to provide sustainably managed bowfisheries in the same way that it does for other fisheries and fishing methods such as rod-and-reel, jug-lining, or noodling. It also sees opportunities for bowfishing to aid in efforts to reduce impacts of non-native invasive species while providing plentiful targets for bowfishers.

Bowfishers are a valued component of the state's recreational stakeholders, and ODWC seeks to ensure that bowfishers are heard, understood, and given opportunities to participate in the sport where these opportunities can be provided responsibly and sustainably.

## *Almost No Management*

Many articles and exciting videos on bowfishing exploits have been created in the past decade, but almost no management plans or articles have been written by wildlife agencies nationwide on how bowfisheries can and should be managed for different species. This was the conclusion in a recently published scientific paper titled "Bowfishing in the United States: history, status, ecological impact, and the need for management" (<https://bit.ly/33jglBX>) written by Jason Schooley, senior fisheries biologist with ODWC, and Dennis Scarnecchia, University of Idaho professor.

One important consideration in bowfishing that emerged immediately in our review was the need to decide, based on both human values and on scientific evidence, how different species should be managed for the benefits of bowfishers and the broader public. With the exception of paddlefish, alligator gar, and flathead catfish, the nongame fishes targeted by bowfishing have no daily size or bag limits and have historically been held in low social regard. However, the nongame fish can be subdivided into two groups: natives such as gars, buffalo fishes, carpsuckers, paddlefish, flathead catfish, and



# Bowfishing in the United States



History, status, ecological impact, and a need for management

D.L. Scarnecchia & J.D. Schooley, 2020. Transactions of the Kansas Academy of Science 123(3-4):285-338.

## Executive Summary

- Bowfishing is an expanding sport, legal in all 50 states
- No states have specific management plans for bowfishing
- Only nine states have bowfishing education programs (+)
- Most states (31) reported bowfishing tournaments (+)
- Most states (34) do not monitor bowfishing or bowfishers
- Management concerns are shared by many states
- Numerous native and invasive species are targeted
- There is selective take of large female fish
- Take should be limited on native fishes

## State Survey Findings



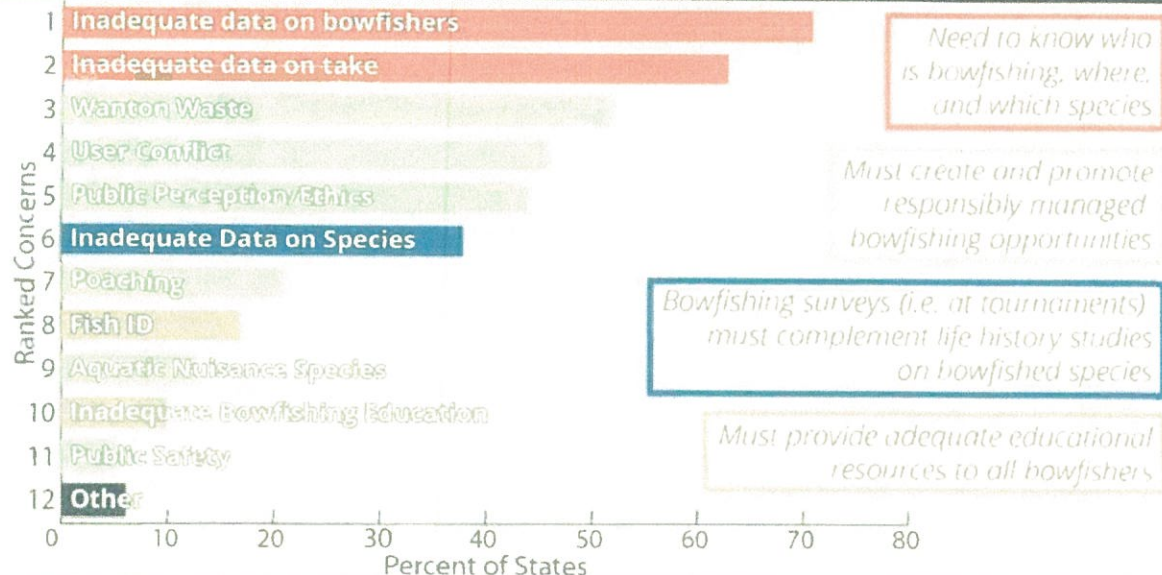
## Species Often Targeted by Bowfishers

Species	Common Names	NATIVE	INVASIVE	LONG-LIVED	REPRODUCTIVE RATE	A significant difference was evident between verbal survey results and observed take at a large bowfishing tournament..	
						% STATED PREFERENCE	% SHOT IN TOURNAMENT
<b>Gars</b>	longnose, alligator <sup>1</sup> , shortnose, spotted	✓	✓	✓	LOW	<b>50</b>	<b>25</b>
<b>Buffalo</b>	smallmouth, bigmouth <sup>2</sup>	✓	✓	✓	LOW	<b>12</b>	<b>55</b>
<b>Carp</b>	common, grass, bighead, silver <sup>3</sup> , black		✓		HIGH	<b>36</b>	<b>17</b>

LIFE HISTORY DATA

TOURNAMENT DATA

## Management Concerns and State Agency Solutions





Nighttime is when many bowfishers prefer to engage in the sport.

*Bignouth Buffalo*



*Freshwater Drum*

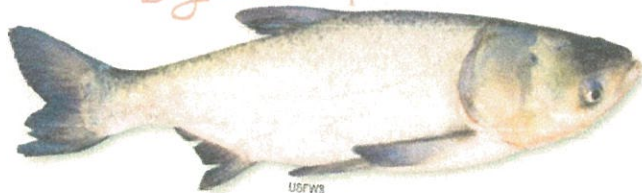


*Silver Carp*



DAN O'KEEFE/MICHIGAN SEA GRANT

*Bighead Carp*



USFWS



WILDLIFE DEPARTMENT.COM

*A boy practices bowfishing while attending a past Wildlife Expo.*

non-native invasive species such as common carp, Asian carps, and grass carp.

Studies nationwide have shown that the non-native species, although edible, have typically seriously disrupted the balance of fish communities and ecology in invaded waters (including in Oklahoma) to the detriment of native species and people. To fisheries managers and recreational anglers, their poor reputation is understandable.

Native species paint a different picture. Even though the wanton eradication of the nongame fishes was advocated by many state wildlife agencies for decades under the assumption that it benefited game fishes, modern scientific studies have shown that species such as buffalo-fishes and gars play important, positive roles that add to the healthy ecosystems supporting vibrant game fish populations and sport fisheries.

Native, nongame fishes also serve as valuable forage for predator game fishes, limit the excessive growth of

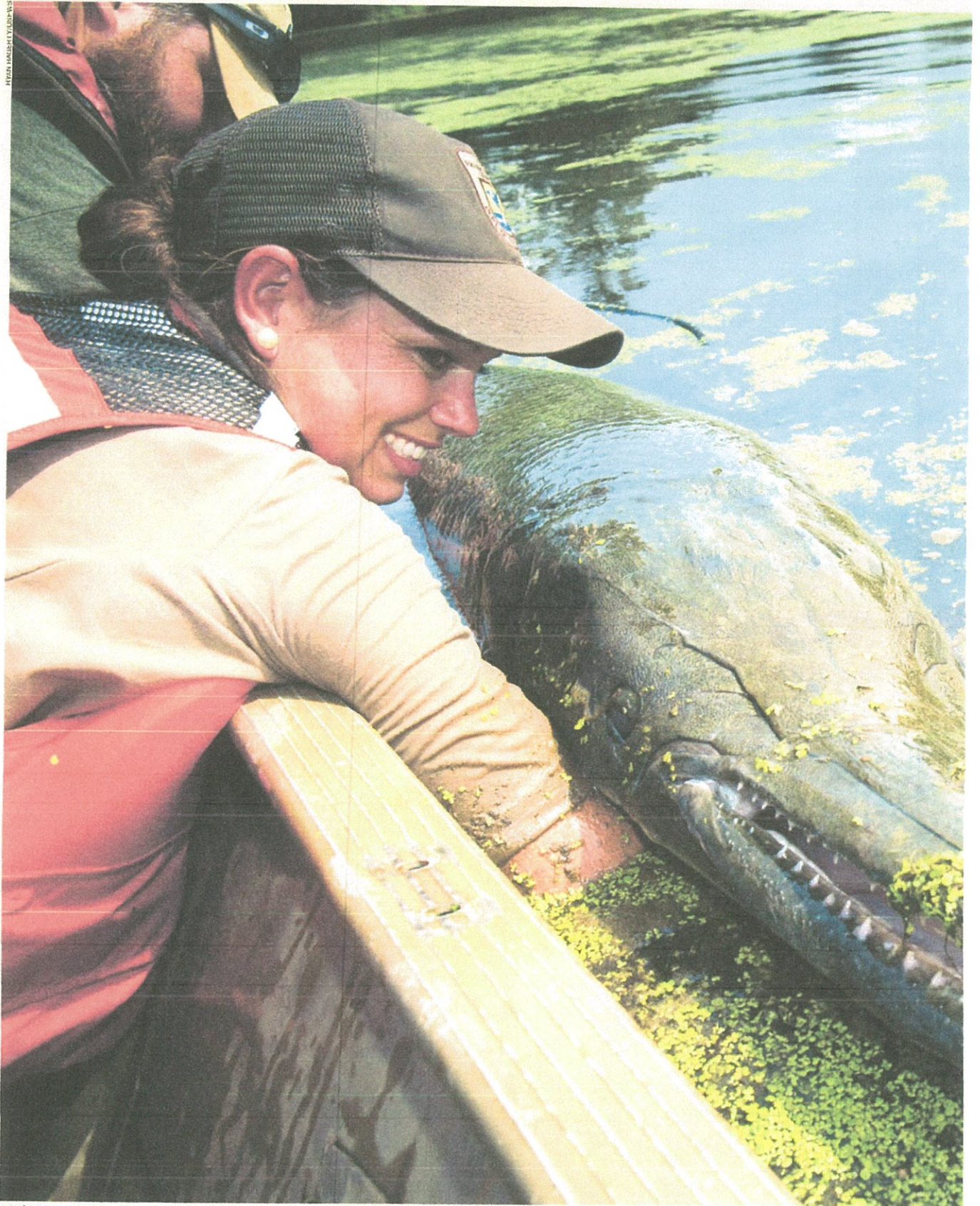
aquatic vegetation, compete with invasive species, and recycle nutrients. Gars, for example, provide checks on overpopulation growth of other nongame or invasive fishes. Although often perceived by sport anglers and bowfishers as abundant nuisances, gars are top preda-



USGS

*A U.S. Geological Survey employee holds a bighead carp, which is a non-native invasive in Oklahoma.*

HELEN HANSEN/STUDENTS



*Biologists capture an alligator gar as part of research. In Oklahoma, alligator gar are a species of special concern and harvest is limited.*



JASON SCHMIDTKE/ODWC

ODWC Fisheries Division intern Jeffrey Colvin and Oklahoma State University graduate student Maeghen Wedgeworth hold bigmouth buffalos. Bigmouth buffalo are not carp, but are in the sucker family and hold the record for the longest-lived freshwater fish in the U.S.



BRANDON BERGHAU/ODWC

Spotted gars are native nongame fish species that bowfishers commonly target.

tors and aid in the balance needed for good sport fishing. They are much less abundant than they often appear to be, in part a result of their loitering or gulping air at the water's surface.

Similarly, buffalofishes can often be seen in groups as they browse for food on rocks near the water's edge or at the surface. In reality, the abundance of these fishes is also typically far lower than appearances would indicate.

All of these native species are highly edible if prepared well.

Based on accumulated ecological evidence, a reasonable management approach has been to favor sustainable native species and eliminate, or at least control, the non-native invasives. Both natives and non-natives are popular with bowfishers, which has created different management approaches.

### Longer Lifespans

A key finding from reviewing studies of the past two decades is that several of the most popular native species targeted for bowfishing have much longer lifespans than formerly realized. A 2019 study on bigmouth buffalo, a species often viewed as a rough fish, found individuals with confirmed ages up to 112 years, perhaps double their previously assumed lifespan and setting the record for the longest-lived freshwater fish species. The aging technique, called Bomb Radiocarbon Dating, used on fish inner ear bones has also confirmed the presence of very old smallmouth buffalo and alligator gar, two other Oklahoma native species popular with bowfishers. It is highly likely that the ages of other suckers and gars have been underestimated as well.





Paddlefish are also known to have long lifespans, with the oldest Oklahoma paddlefish estimated at 29 years. We now know that these native species, as well as the others that are also popular bowfishing targets, grow more slowly, are less productive and are more easily depleted, requiring many more years to rebuild than formerly realized. This recognition requires more conscientious management from ODWC and other agencies.

A second finding is that reproductive success of many of these long-lived native species is not guaranteed every year but is often episodic, occurring strongly in one year but more commonly weakly or not at all in most other years. These species may require specific spawning and rearing conditions (like high spring river flows allowing a spawning migration to a certain habitat) for a strong reproduction year. These optimal conditions are not met in most years. But because they live a long time, they can persist even with only occasionally or irregularly having a successful reproductive year. All of the native nongame species described here typically fall into this category. It was often assumed that these fishes reproduced successfully in most or all years. Now we know that management must consider the potential-

ly limited addition of young fish into these populations.

Another finding is that in all native fish species targeted by bowfishers, the largest individuals are females. And the females mature later and outlive the males on average, making the largest and oldest fish predominantly females. The males of these bowfished species do not compete for spawning with females, so they don't have to grow larger. Larger females benefit from delaying their maturity, growing larger and having more eggs.

The bottom line is that bowfishers targeting the largest fish of a species will unfortunately be taking females, a much less sustainable occurrence than if they were targeting males, as hunters often do with deer, elk, and turkeys. And unlike those land-based species, where, for example, antlers identify the sex, there are no reliable ways for bowfishers to identify female fish from males before they are shot and killed, other than by size.

This pattern of taking larger, older female fishes has a detrimental effect on a population's harvest sustainability. Therefore, it is important to somehow limit the removal of these older, larger females, which have been shown in other fish species to be important to the long-term reproductive success and health of the fish population.



WILDLIFEDEPARTMENT.COM

People attending the Department's Wildlife Expo have a chance to experience bowfishing.



KEETON\_JONES/READERS PHOTO SHOWCASE 2016

A bowfisher enjoys the sport in the Cimarron River in Kingfisher County.



BILLY POPP/ICR/CC-BY/ND/3.0

Few states have bowfishing education programs.



NICK BLOOMFIELD/USFWS

*A technician holds a large grass carp, a non-native species that offers plenty of opportunities to Oklahoma bowfishers.*



WILDLIFE/DEPARTMENT.COM

*River redhorse*



*Bowfishing tournaments provide great opportunities for wildlife agencies to learn more about the sport.*

Because larger, older females are perhaps all selectively removed by bowfishing, ODWC, as a management goal, would not support shortening the life of these bowfished species.

### *Invasives Equal Opportunities*

These findings about native, nongame fishes indicate that managers here and nationwide need more information on population numbers and management practices. Unfortunately, with few exceptions including paddlefish and alligator gar, the native nongame species have no harvest restrictions in Oklahoma. Too little is known of their abundance, status, ecology, or biology.

Bowfishing for these native, nongame fishes requires responsibly managed fisheries. Some native species and local populations will be candidates for sustainable bowfishing under regulations, and others will not. The native species are not good candidates for high or unlimited bag limits. And for those species, bowfishing regulations may need to be developed similar to those for more valued bowhunted species on land.

For non-native invasive species, opportunities for abundant bowfishing are much more favorable. These species offer plentiful targets with few if any bag limits, which popular media indicates is a scenario desired by many bowfishers. Many opportunities exist for bowfishers to assist in fisheries conservation by helping reduce non-native invasives and their competition with native species.

The common carp and grass carp serve as ideal targets for abundant bowfishing. On a larger scale, and with potentially greater ecological benefit, the selective taking of silver carps and bighead carps from Oklahoma waters

and beyond would be an ideal opportunity for bowfishers seeking nearly unlimited targets. The startled jumping behavior of silver carps adds an element of challenge and excitement for bowfishers.

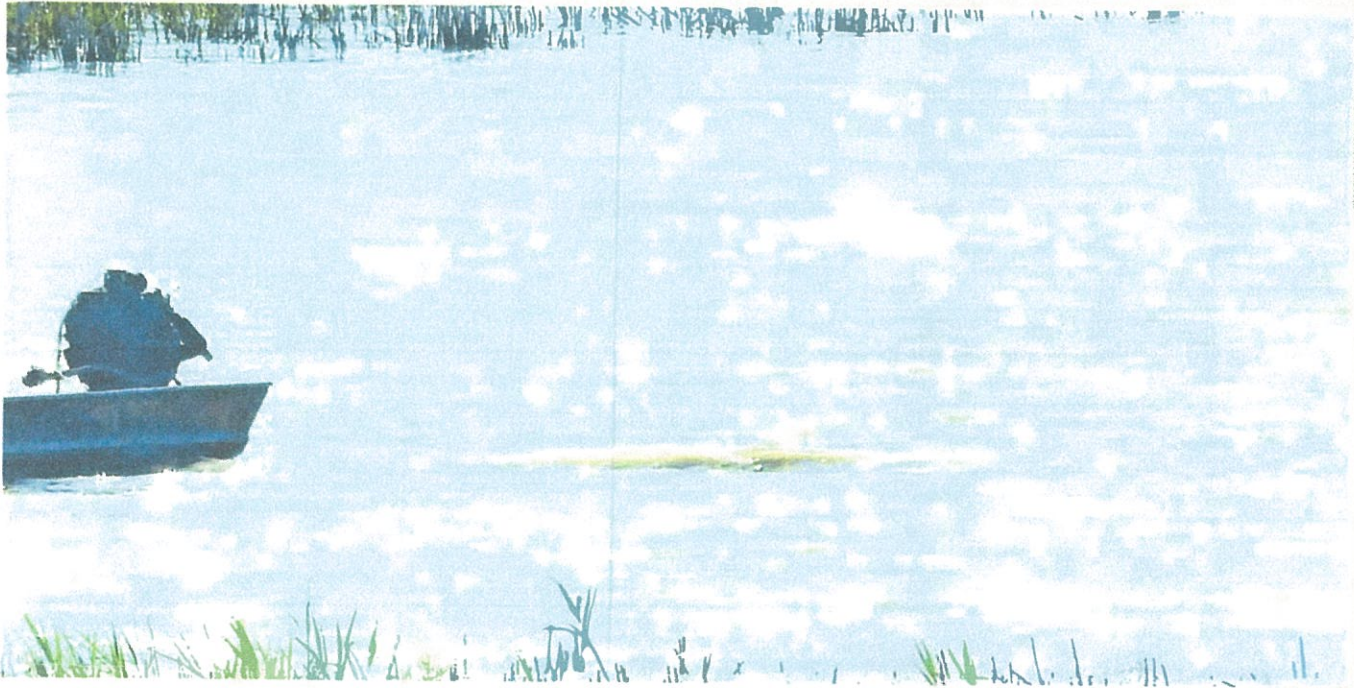
If bowfishers selectively target the largest fish of these species (the females), it would be especially beneficial to the native, nongame species competing with them for space and resources. And ultimately, removing non-natives would also benefit game fishes.

Fortunately, silver carps and bighead carps have not successfully invaded most of Oklahoma at this time. Bowfishing opportunities for these species are found in several of the lower Red River tributaries in southeastern Oklahoma. And clearly, native game and nongame species would clearly benefit if the non-natives do not spread.

ODWC is also seeking a better understanding of the state's bowfishers. Although our statewide surveys indicate that bowfishers make up only a small fraction of Oklahoma fishing license buyers (perhaps 5 percent to 8 percent), it is likely that they are under-represented in our angler surveys. Targeted bowfisher surveys will likely be required to better describe the demographics, abundance, habits, needs, and impacts of bowfishers. ODWC intends to work with bowfishing tournaments as a cost-effective way to learn more about Oklahoma's bowfishing and bowfishers.

### *A Need for Management*

Bowfishing in Oklahoma and across the country is changing. The sport is expanding and evolving rapidly. Sustainable management of bowfisheries has lagged, and the need for management to catch up to the fisheries is clear.



JIM MULLHAUPT/FICKR CC BY/NC/ND 3.0

In our review paper's survey of all 50 state fish and wildlife agencies, we found that bowfishing is legal in all 50 states, but that no states reported having any articulated bowfishing management plans, goals, or philosophies. State managers noted concerns with bowfishing related primarily to inadequacies in data on bowfishers, on bowfishing harvest, and on the species harvested.

Less than 20 percent of states reported having bowfishing education programs. Fortunately, Oklahoma is a leader in bowfishing education, with ODWC's vibrant Archery in the Schools program, which includes a bowfishing curriculum. ODWC has also taken an active role in research relevant to native, nongame species biology, ecology, and bowfishing management.

The challenge for ODWC, under the Public Trust Doctrine, is to fulfill its mission to protect and enhance our state's natural resources for present and future generations. Under the North American Model of Fish and Wildlife Conservation (see here), fish and wildlife are a public resource to be managed responsibly and should not be killed for frivolous reasons or wasted (for example, shot and discarded).

ODWC also has a mission to provide enjoyable recreational angling opportunities for our fishing license buyers. Managed fisheries that are good for bowfishers and not detrimental to the native fishes often targeted by the sport are good for Oklahoma.

By working with bowfishers, monitoring

the native species for sustainability, and encouraging bowfishers to harvest invasive species, ODWC can better meet the challenge to provide ample bowfishing opportunities while managing bowfisheries as it does all fisheries — as instruments of species conservation, of public benefit, and of sound, long-term public policy. 🎯



JOSH HAMPTON/REIZERS PHOTO SHOWCASE 2015

*Bowfishing regulation and management across the nation is uncommon.*